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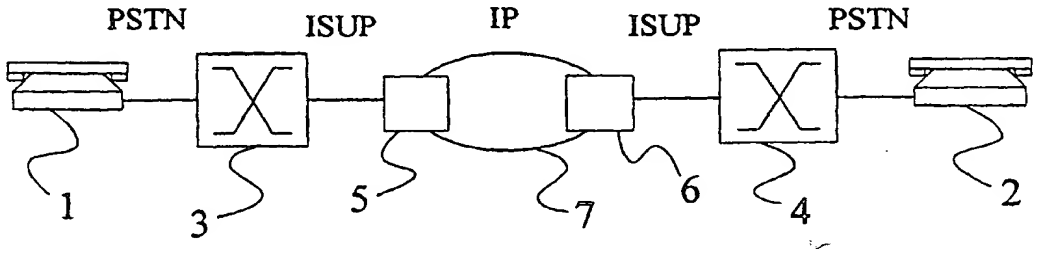
With international search report.

(54) Title: DETERMINATION OF THE PROPAGATION DELAY IN A PACKET SWITCHED NETWORK



(57) Abstract

A method of determining the propagation delay over a packet switched network intented to provide a segment of a telephone circuit. In response to a request for a telephone circuit between two subscribers, a packet containing an echo request message is transmitted over the packet switched network from a first network node to a second network node. The second network node reacts to receipt of the echo request message by transmitting a packet containing an echo reply message to the first network node. The first network node then determines the round trip propagation delay for the packet switched network segment on the basis of the time which elapses between sending the echo request message from the first node and receiving the echo reply message also at the first node.

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DETERMINATION OF THE PROPAGATION DELAY IN A PACKET SWITCHED NETWORK

Field of the Invention

The present invention relates to packet switched networks and more particularly to the transmission of real time voice and data information over a packet switched network.

Background to the Invention

Conventional telecommunications networks for conveying voice and other user information have in general relied upon dedicated telecommunications network infrastructure and transmission protocols. However, with the recent explosive growth in digital data transmission, driven in particular by the use of intranets and the Internet, there has been a move towards the use of more generic infrastructure and transmission protocols in the telecommunications industry. This move is driven primarily by the desire for interoperability between telecommunications networks and other data networks, and secondarily by the cost and performance advantages which general data network systems offer over conventional telecommunications systems.

There exist proposals for the replacement of certain parts of telecommunications networks with packet switched networks and in particular with Internet Protocol (IP) networks. For example, telephone exchanges may be interconnected via IP networks for the purpose of carrying both signalling and user voice and data information.

Subscriber telephone terminals in a Public Switched Telephone Network (PSTN) are generally connected to

respective local exchanges via two-wire connections which provide for duplex (i.e. bidirectional) communication. A so-called "hybrid" located at the local exchange converts the bidirectional voice signals from the two-wire lines into unidirectional signals for transmission over four-wire lines used in the inter-exchange trunk connections. Imperfections in the hybrids may allow leakage of signals back to a speaker's telephone from where the signals originated, giving rise to the perception of an echo.

In conventional networks, the problem of echo is reduced by including an echo cancellation device in a telephone circuit if the propagation delay over the circuit exceeds some predefined period (e.g. 15msec). As the route taken by a telephone circuit is not always predefined, the first exchange in the circuit identifies the "statically" defined delay for next leg and forwards this to the exchange at the end of that leg. The receiving exchange then appends the delay for the next leg to the already accumulated delay and forwards this to the next exchange and so on. When the accumulated delay exceeds the predefined period, a backward message is sent to the originating exchange asking for an incoming or outgoing echo cancellation device to be included in the circuit.

The above process works because in conventional telephone circuits, which use circuit switched traffic channels, the propagation delay over a circuit leg can be predicted with great accuracy. The proposal to transmit telephone voice data between exchanges using a packet switched network upsets this situation as by its very nature packet switched circuits are unpredictable. Unpredictability arises both because a packet may be transmitted between two end points by one of several

different routes and because the network uses only a "best effort" to transmit a packet, i.e. if the network is busy a packet may have to wait or may indeed be lost. The propagation delay over a circuit link provided by a packet switched network cannot therefore be statically defined.

Summary of the Present Invention

It is an object of the present invention to overcome or at least mitigate the above noted disadvantages of using packet switched networks in telecommunication networks. It is a further object of the present invention to provide a telecommunication network in which the propagation delay for voice data sent over a packet switched network can be dynamically determined for the purposes of echo cancellation.

According to a first aspect of the present invention there is provided a method of determining the propagation delay over a packet switched network intended to provide a segment of a telephone circuit for carrying information between at least two subscriber terminals, the method comprising:

reacting to a request for a telephone circuit between said two subscribers by transmitting a packet containing an echo request message over the packet switched network from a first network node to a second network node;

reacting to receipt of the echo request message at the second network node by transmitting a packet containing an echo reply message over the packet switched network from the second network node to the first network node; and

and determining the round trip propagation delay for the packet switched network segment on the basis of

the time which elapses between sending the echo request message from the first node and receiving the echo reply message also at the first node.

Preferably, the propagation delay for the packet switched network segment is determined prior to the sending of an Initial Address Message (IAM) over the packet switched network segment. More preferably, the determined round trip delay is appended or added to delays determined for preceding circuit segments defined in the IAM, for transmission over the packet switched network.

Preferably, the method described above is employed with an IP network.

According to a second aspect of the present invention there is provided apparatus for determining the propagation delay over a packet switched network intended to provide a segment of a telephone circuit for carrying information between at least two subscriber terminals, the apparatus comprising:

a first packet switched network node coupled between a first subscriber and the packet switched network and arranged to react to a request for a telephone circuit between said two subscribers by transmitting a packet containing an echo request message over the packet switched network to a second packet switched network node;

the second node being arranged to react to receipt of the echo request message by transmitting a packet containing an echo reply message over the packet switched network to the first network node; and

processing means associated with the first network node arranged to determine the round trip propagation delay for the packet switched network segment on the basis of the time which elapses between sending the echo

request message from the first node and receiving the echo reply message also at the first node.

Brief Description of the Drawings

For a better understanding of the present invention and in order to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 shows schematically a telecommunications system incorporating an IP network; and

Figure 2 is a flow diagram showing a part of a call set-up phase in the system of Figure 1.

Detailed Description of Certain Embodiments

There is illustrated in Figure 1 a telephone system in which a pair of subscriber telephone terminals 1,2 are connected to respective local access exchanges 3,4 via PSTN access networks. The access exchanges 3,4 are in turn connected to respective IP gateway nodes 5,6 via an ISUP (ISDN User Part) interface. Interconnection between the gateway nodes 5,6 is provided via an IP network 7 which may be the Internet or, as is more likely, a closed network employing the TCP/IP protocol.

It will be appreciated that the example shown in Figure 1 is greatly simplified and the system may include one or more transit exchanges connecting the local access exchanges 3,4 to the IP gateway nodes 5,6. Moreover, the connection between the subscriber terminals 1,2 and the access exchanges 3,4 may be made via one or more intermediate "routers". It will also be appreciated that the IP network 7 comprises a number of interconnected routers such that the path taken by a

packet between the two gateway nodes 5,6 may vary under different circumstances.

Full details of a typical call set-up procedure in a PSTN will not be given here. Rather, the reader is referred to for example to "Understanding Telecommunications", Studentlitteratur, Sweden (ISBN 91-44-00214-9). For the purpose of the present discussion it is sufficient to note that after an access exchange 3 receives a B-number dialled by a subscriber telephone 1, interexchange signalling takes place over the ISUP interface to establish a telephone circuit for the requested call.

In the example of Figure 1, an Initial Address Message (IAM) requesting allocation and reservation of a circuit is passed from the access exchange 3 to the gateway node 5. This IAM identifies the destination exchange 4, from which the gateway node 5 determines that the next leg of the circuit extends over the IP network 7 to the second gateway node 6. The originating side gateway node 5 formulates an Echo Request message and transmits this over the IP network 7 to the terminating side gateway node 6, which responds by returning an Echo Reply message. On the basis of the time elapsed between transmitting the Echo Request message and receiving the Echo Reply message the originating side gateway node 5 is able to determine the round trip propagation delay for a data packet under the current IP network conditions.

The determined propagation delay is then appended to any accumulated delays already included in the IAM received by the originating side gateway 5 from the access exchange 3 (e.g. the round trip propagation delay between the access exchange 3 and the gateway node 5).

The modified IAM is then sent over the IP network 7 to the terminating side gateway node 6 where the (static) round trip propagation delay for the link between that gateway node 6 and the terminating side exchange 4 is further appended to the IAM contained delay. The IAM can then be passed to the terminating exchange 4. Following the establishment of the complete telephone circuit, an Address Complete Message (ACM) is returned from the terminating exchange 4 to the originating exchange 3, the message containing the total accumulated propagation delay.

A decision on whether to introduce an incoming or outgoing echo cancellation device into the telephone circuit may be made at the originating exchange 3 on the basis of accumulated propagation delay returned in the ACM. Alternatively, an echo cancellation device may be introduced at the terminating side access exchange 4.

Figure 2 illustrates further the steps involved in calculating the round trip propagation delay at the originating side gateway node 5.

It will be appreciated by the person of skill in the art that modifications may be made to the above described embodiment without departing from the scope of the present invention. For example, whilst the above description has been concerned with the use of an IP network, the invention is applicable to any suitable packet switched network.

Claims

1. A method of determining the propagation delay over a packet switched network intended to provide a segment of a telephone circuit for carrying information between at least two subscriber terminals, the method comprising:

reacting to a request for a telephone circuit between said two subscribers by transmitting a packet containing an echo request message over the packet switched network from a first network node to a second network node;

reacting to receipt of the echo request message at the second network node by transmitting a packet containing an echo reply message over the packet switched network from the second network node to the first network node; and

and determining the round trip propagation delay for the packet switched network segment on the basis of the time which elapses between sending the echo request message from the first node and receiving the echo reply message also at the first node.

2. A method according to claim 1 and comprising determining the propagation delay for the packet switched network segment prior to the sending of an Initial Address Message (IAM) over the packet switched network segment.

3. A method according to claim 2 and comprising appending or adding the determined round trip delay to delays determined for preceding circuit segments and defined in the IAM, for transmission over the packet switched network.

4. A method according to any one of the preceding claims wherein the packet switched network is an IP network.

5. Apparatus for determining the propagation delay over a packet switched network intended to provide a segment of a telephone circuit for carrying information between at least two subscriber terminals, the apparatus comprising:

a first packet switched network node coupled between a first subscriber and the packet switched network and arranged to react to a request for a telephone circuit between said two subscribers by transmitting a packet containing an echo request message over the packet switched network to a second packet switched network node;

the second node being arranged to react to receipt of the echo request message by transmitting a packet containing an echo reply message over the packet switched network to the first network node; and

processing means associated with the first network node arranged to determine the round trip propagation delay for the packet switched network segment on the basis of the time which elapses between sending the echo request message from the first node and receiving the echo reply message also at the first node.

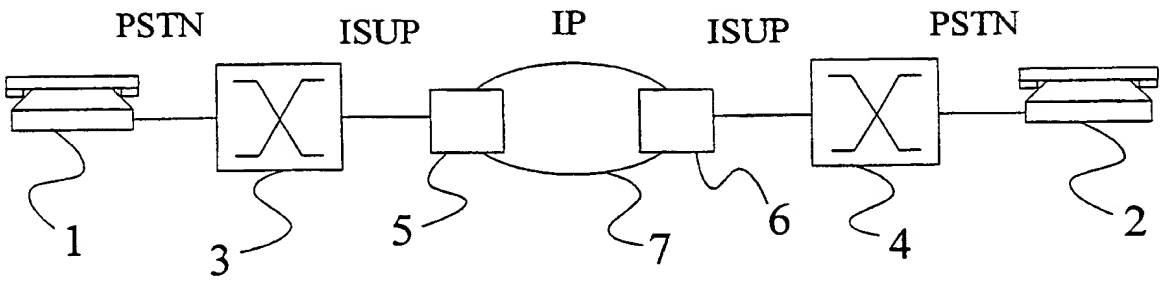

Figure 1

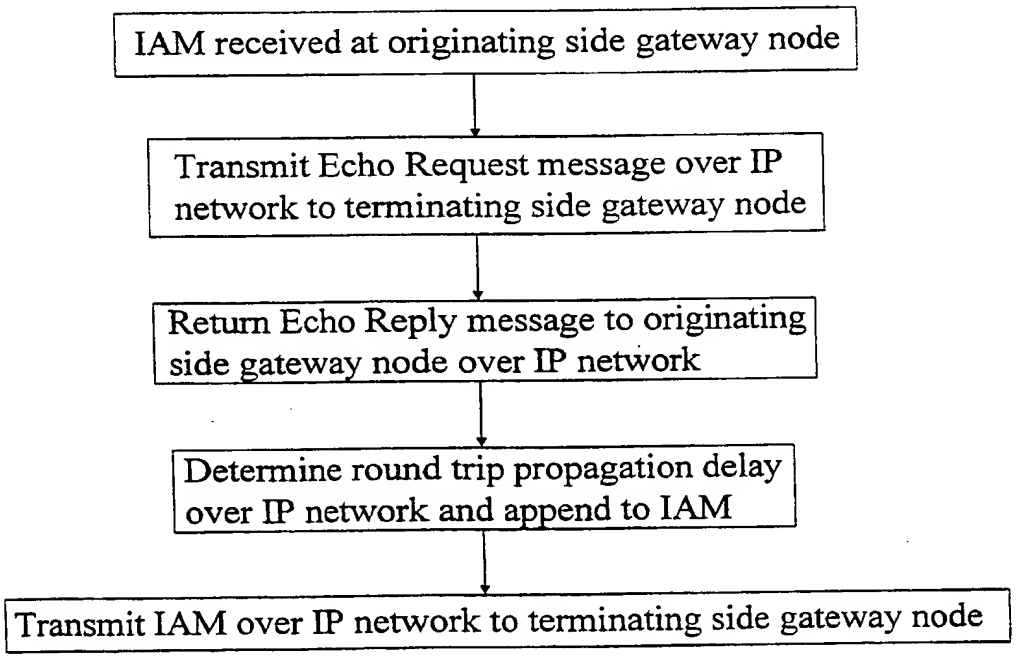

Figure 2

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 99/08067

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/64

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 781 554 A (ORGAN RUPERT J) 14 July 1998 (1998-07-14) column 1, line 24 - line 46	1,5
Y	page EP090595, column 3, line 57 -column 4, line 12	2-4
Y	WO 97 26763 A (ERICSSON TELEFON AB L M) 24 July 1997 (1997-07-24) page 15, line 3 -page 16, line 17	2,3
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P,X	EP 0 905 959 A (COMVERSE NETWORK SYST INC) 31 March 1999 (1999-03-31) column 5, line 5 - line 19 column 13, line 42 - line 55	1,4,5

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
7 February 2000	18/02/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Gregori, S

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 99/08067

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		JP 11191791 A	13-07-1999

PATENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
8K18PC		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP 99/ 08067	26/10/1999	27/10/1998

Applicant

TELEFONAKTIEBOLAGET LM ERICSSON (publ) et al.

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

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   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

   [ ] the text is approved as submitted by the applicant.

   [X] the text has been established by this Authority to read as follows:

   DETERMINATION OF THE PROPAGATION DELAY IN A PACKET SWITCHED NETWORK

5. With regard to the **abstract**,

   [X] the text is approved as submitted by the applicant.

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6. The figure of the **drawings** to be published with the abstract is Figure No. 1

   [X] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

[redacted]ational Application No
PCT/EP 99/08067

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/64

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Date of the actual completion of the international search	Date of mailing of the international search report
7 February 2000	18/02/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Gregori, S

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 99/08067

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		JP 11191791 A	13-07-1999

ATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 06 July 2000 (06.07.00)	
International application No. PCT/EP99/08067	**Applicant's or agent's file reference** 8K18PC
International filing date (day/month/year) 26 October 1999 (26.10.99)	**Priority date** (day/month/year) 27 October 1998 (27.10.98)
Applicant GRAF, Leslie et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

25 May 2000 (25.05.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Juan Cruz
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Claims

1. A method of determining the propagation delay over a packet switched network intended to provide a segment of a telephone circuit for carrying information between at least two subscriber terminals, the method comprising:

reacting to a request for a telephone circuit between said two subscribers by transmitting a packet containing an echo request message over the packet switched network from a first network node to a second network node;

reacting to receipt of the echo request message at the second network node by transmitting a packet containing an echo reply message over the packet switched network from the second network node to the first network node; and

and determining the round trip propagation delay for the packet switched network segment on the basis of the time which elapses between sending the echo request message from the first node and receiving the echo reply message also at the first node.

2. A method according to claim 1 and comprising determining the propagation delay for the packet switched network segment prior to the sending of an Initial Address Message (IAM) over the packet switched network segment.

3. A method according to claim 2 and comprising appending or adding the determined round trip delay to delays determined for preceding circuit segments and defined in the IAM, for transmission over the packet switched network.

4. A method according to any one of the preceding claims wherein the packet switched network is an IP network.

5. Apparatus for determining the propagation delay over a packet switched network intended to provide a segment of a telephone circuit for carrying information between at least two subscriber terminals, the apparatus comprising:

a first packet switched network node coupled between a first subscriber and the packet switched network and arranged to react to a request for a telephone circuit between said two subscribers by transmitting a packet containing an echo request message over the packet switched network to a second packet switched network node;

the second node being arranged to react to receipt of the echo request message by transmitting a packet containing an echo reply message over the packet switched network to the first network node; and

processing means associated with the first network node arranged to determine the round trip propagation delay for the packet switched network segment on the basis of the time which elapses between sending the echo request message from the first node and receiving the echo reply message also at the first node.

PATENT COOPERATION TREATY

PCT

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
8K18PC		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP99/08067	26/10/1999	27/10/1998
International Patent Classification (IPC) or national classification and IPC H04L12/64		
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (publ) et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☒ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
25/05/2000	11. 01. 01
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Kappatou, E Telephone No. +49 89 2399 7521

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/08067

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:
Description, pages:

1-7	as originally filed

Claims, No.:

1-4	as received on	27/10/2000	with letter of	27/10/2000

Drawings, sheets:

1/1	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   - ☐ the description, pages:
   - ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)
   see separate sheet

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2,3
	No:	Claims	1,4
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-4
Industrial applicability (IA)	Yes:	Claims	1-4
	No:	Claims	

2. Citations and explanations
   see separate sheet

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

   see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item I

Basis of the report

The amendments filed with the letter dated 27.10.2000 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT.

Originally filed independent claims 1 and 4 refer to a packet containing echo request message and a packet containing an echo reply message. Amended claims 1 and 4 refer to **voice** packets containing either echo request or echo reply messages.

In the original disclosure of the application it is mentioned that the application relates to transmission of real time voice and data information. However there is no reference of the kind of packet where the echo request message is to be included.

Since no basis for such an extension can be found in the application as filed, the above amendment shall be ignored.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

   D1: US-A-5 477 531
   D2: US-A-5 781 554
   D3: WO 97 26763 A

2. The subject-matter of claim 1 is not new, Article 33(2) PCT.

2.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses in abstract and column 4, lines 3 to 23 (the references in parentheses applying to this document):

a method of determining a propagation delay (see abstract, line 15) over a router

controlled IP network (see column 4, line 13 and column 1, lines 25 to 30) providing a segment of a telephone circuit for carrying information between at least two subscriber terminals, the method comprising:

reacting to a request for a telephone circuit between said two subscriber terminals by transmitting a packet containing an echo request message (column 4, line 14) over the router controlled IP network from a first network node to a second network node (stations 11 and 12 respectively);

reacting to receipt of the echo request message at the second network node by transmitting a packet containing an echo reply message over the router controlled IP network from the second network node to the fist network node (column 4, lines 15 and 16: "station 12 will respond accordingly" to the echo request implies sending the echo reply);

and determining the propagation delay for the router controlled IP network segment on the basis of the time which elapses between sending the echo request message from the first node and receiving the echo reply message also at the first node (abstract, line 8 and column 6, lines 54 to 55).

3. Claim 4 corresponds to claim 1 and is therefore also not new.

4. Dependent claims 2 and 3 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, the reasons being as follows:

4.1 Document D2 refers to time delay determination between nodes in the network and discloses in column 3, line 64, that the first stage in the communication process is to determine the time delay introduced by the transmission path. This implies that all other stages, including that of sending the IAM, will be done later.

4.2 Adding the determined delay to others referring to preceding segments and applying it to the IAM before sending it further is commonly known (document D3, page 15, line 3 to page 16, line 17). It would be obvious to the person skilled in the art to do so also in the case where one of the path segments is over an IP

network.

Re Item VI
Certain documents cited

Certain published documents (Rule 70.10)

Application No Patent No	Publication date *(day/month/year)*	Filing date *(day/month/year)*	Priority date *(valid claim)* *(day/month/year)*
EP 0 905 959 A2	31.03.1999	31.07.1998	01.08.1997

Re Item VII
Certain defects in the international application

1. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

2. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 to D3 is not mentioned in the description, nor are these documents identified therein.

3. The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.

4. The sheets of the claims do not have line numbering (Rule 11.8 PCT).

Re Item VIII
Certain observations on the international application

1. There is no antecedent definition for the term "**the** propagation delay" in line 3 of claim 1.

   It should be noted that the above term is appearing also as "the round trip

propagation delay" (in claim 1, line 18), and as "the determined round trip delay" (claim 3, line 31). This leads to unclarity whether there are more than one delays to determine.

2. The term in line 9 of claim 1 "said two subscribers" has no antecedent definition. The same applies for line 9 of claim 4.

Claims

1. A method of determining the propagation delay over a router controlled IP network intended to provide a segment of a telephone circuit for carrying information between at least two subscriber terminals, the method comprising:

reacting to a request for a telephone circuit between said two subscribers by transmitting a voice packet containing an echo request message over the router controlled IP network from a first network node to a second network node;

reacting to receipt of the echo request message at the second network node by transmitting a voice packet containing an echo reply message over the router controlled IP network from the second network node to the first network node; and

and determining the round trip propagation delay for the router controlled IP network segment on the basis of the time which elapses between sending the echo request message from the first node and receiving the echo reply message also at the first node.

2. A method according to claim 1 and comprising determining the propagation delay for the router controlled IP network segment prior to the sending of an Initial Address Message (IAM) over the router controlled IP network segment.

3. A method according to claim 2 and comprising appending or adding the determined round trip delay to delays determined for preceding circuit segments and defined in the IAM, for transmission over the router controlled IP network.

4. Apparatus for determining the propagation delay over a router controlled IP network intended to provide a segment of a telephone circuit for carrying information between at least two subscriber terminals, the apparatus comprising:

a first router controlled IP network node coupled between a first subscriber and the router controlled IP network and arranged to react to a request for a telephone circuit between said two subscribers by transmitting a voice packet containing an echo request message over the router controlled IP network to a second router controlled IP network node;

the second node being arranged to react to receipt of the echo request message by transmitting a voice packet containing an echo reply message over the router controlled IP network to the first network node; and

processing means associated with the first network node arranged to determine the round trip propagation delay for the router controlled IP network segment on the basis of the time which elapses between sending the echo request message from the first node and receiving the echo reply message also at the first node.

PATENT COOPERATION TREATY

16 -01- 2001

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

BORENIUS & CO OY AB
Kansakoulukuja 3
FI-00100 Helsinki
FINLANDE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	11. 01. 01

Applicant's or agent's file reference	IMPORTANT NOTIFICATION
8K18PC	

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP99/08067	26/10/1999	27/10/1998

Applicant
TELEFONAKTIEBOLAGET LM ERICSSON (publ) et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/
European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer
Ahrens, R
Tel.+49 89 2399-8136

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ EP

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA	Date of receipt of DEMAND

Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION

Applicant's or agent's file reference: 8K18PC

International application No.	International filing date *(day/month/year)*	(Earliest) Priority date *(day/month/year)*
PCT/EP99/08067	26 Oct 1999 (26.10.99)	27 Oct 1998 (27.10.98)

Title of invention:
DETERMINATION OF THE PROPAGATION DELAY IN A PACKET SWITCHED NETWORK

Box No. II APPLICANT(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

TELEFONAKTIEBOLAGET L M ERICSSON (publ)
S-126 25 Stockholm
Sweden

Telephone No.:

Facsimile No.:

Teleprinter No.:

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
SE	SE

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

GRAF, Leslie
3 Hender Court, Balwyn
VIC 3103
Australia

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
AU	AU

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

GROVES, Christian
21 Garden Avenue, Keilor
VIC 3036
Australia

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
AU	AU

☐ Further applicants are indicated on a continuation sheet.

International application No.
PCT/EP99/08067

Continuation of Box No. II **APPLICANT(S)**

If none of the following sub-boxes is used, this sheet should not be included in the demand.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

RYTINA, Ian
28/25 Barkly Street, Carlton
VIC 3053
Australia

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

☐ Further applicants are indicated on another continuation sheet.

See Notes to the demand form

International application No.
PCT/EP99/08067

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is [X] agent [ ] common representative

and [X] has been appointed earlier and represents the applicant(s) also for international preliminary examination.

[ ] is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

[ ] is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

Borenius & Co Oy Ab
Kansakoulukuja 3
FIN-00100 Helsinki
Finland

Telephone No.: +358 9 686 6840

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Teleprinter No.:

[ ] **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments:*

1. The applicant wishes the international preliminary examination **to start on the basis of:**

[X] the international application as originally filed

the description
- [X] as originally filed
- [ ] as amended under Article 34

the claims
- [X] as originally filed
- [ ] as amended under Article 19 (together with any accompanying statement)
- [ ] as amended under Article 34

the drawings
- [X] as originally filed
- [ ] as amended under Article 34

2. [ ] The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. [ ] The applicant wishes the start of the international preliminary examination **to be postponed** until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English

- [X] which is the language in which the international application was filed.
- [ ] which is the language of a translation furnished for the purposes of international search.
- [ ] which is the language of publication of the international application.
- [ ] which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby **elects all eligible States** *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*.

excluding the following States which the applicant wishes **not to elect:**

See Notes to the demand form

Sheet No. 4

International application No.
PCT/EP99/08067

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

			For International Preliminary Examining Authority use only	
			received	not received
1. translation of international application	:	sheets	☐	☐
2. amendments under Article 34	:	sheets	☐	☐
3. copy (or, where required, translation) of amendments under Article 19	:	sheets	☐	☐
4. copy (or, where required, translation) of statement under Article 19	:	sheets	☐	☐
5. letter	:	sheets	☐	☐
6. other *(specify)*	:	sheets	☐	☐

The demand is also accompanied by the item(s) marked below:

1. [X] fee calculation sheet
2. [ ] separate signed power of attorney
3. [ ] copy of general power of attorney; reference number, if any:
4. [ ] statement explaining lack of signature
5. [ ] nucleotide and or amino acid sequence listing in computer readable form
6. [ ] other *(specify)*:

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

Borenius & Co Oy Ab

Hannes Heikkilä
European Patent Attorney (0082340)

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been informed accordingly.
4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on: